INFLUENCE OF TECHNOLOGY READINESS AND TECHNOLOGY BARRIERS ON TECHNOLOGY ADOPTION BY TEACHERS

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by

GENIMON V JOSEPH

Under the supervision of

KENNEDY ANDREW THOMAS

Professor

CHRIST
(DEEMED TO BE UNIVERSITY)
BANGALORE · INDIA

Signature of Scholar **Signature of Supervisor**

Centre for Research

CHRIST (Deemed to be University)

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ABSTRACT

This research is on the Technology Adoption of HSS teachers. Based on the detailed review of the literature, the research question is formulated as how the Technology Adoption is influenced by Technology Readiness, Technology Exposure, Technology Anxiety, Technology Barriers, and Technology Use among Higher Secondary School teachers? This descriptive study titled 'Influence of Technology Readiness and Technology Barriers on Technology Adoption by Teachers' was conducted among the Higher Secondary School teachers of Kerala, India. The structured questionnaire was used to gather 1029 data form six educational districts in the cluster sampling model. Data analysis was done as per the research objectives, and hypotheses were duly tested. The statistical packages were used for data analysis and hypothesis testing. The data were coded, secured, and personal identification details were not used at any stage of this study. The present study identified a well-maintained technology infrastructure at HSS schools. Demographic factors were not made differentiation among teachers. Technology Adoption and its predictors were correlated and influenced others. The Technology Anxiety and Technology Barrier negatively influenced Technology Adoption process and was reduced with the Technology Readiness and Technology Exposure. Technology Use has a positive mediatory influence on the adoption process. The implications of this research are very relevant and helpful in strategic digital technology formulation even at policy levels.

Keywords: Technology Adoption, Technology Readiness, Technology Exposure, Technology Anxiety, Technology Barriers, Technology Use

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1. INTRODUCTION

1.1 Background of the Study

The modern world is ever dynamic with processes and relationships redefined with the radical paradigm shifts in tune with the exponential knowledge explosion and advent of digitalization (Kagermann, 2015; Noble, 2017).

The Millennial and Post-Millennial learners are often denoted as the 'Digital Natives' and their teachers were often termed as the 'Digital Immigrants' (Prensky, 2001). Bridging the digital divide between the learners and educators became a critical concern of the era (Welsh, 2016; Onar, 2018). This descriptive research was designed to study the HSS teachers' Technology Adoption with respect to their Technology Readiness, Technology Barriers, Technology Anxiety, Technology Use, and Technology Exposure in using the digital learning environments at Higher Secondary Schools of educational districts of Kerala.

1.2 The Education Technology Initiatives of the Kerala State

The education technology initiatives of the Kerala State were organized with the 'IT@School' established in 2001 and Kerala Infrastructure and Technology for Education (KITE) was established in 2017. During the Covid-19 pandemic, the State could virtually open full-fledged schooling throughout Kerala exactly on normal reopening day, through the multiple technology platforms.

The unparalleled advancement of the socio-economic sectors in Kerala was mainly fuelled by the technology-based exponential growth in the education sector. So, it was worth to study this surpassing leadership brought through the technology-enabled strenuous efforts of the Kerala education system at the backdrop of the Technology Adoption Process.

1.3 The Concept of Technology Adoption Process

"Technology is anything that reduces the human effort on the desired action" (Rogers, 2003, p. 259) and Technology Adoption is a term that refers to the acceptance, integration, and use of new technology in society (Technology

Adoption, 2020). The technology could be understood as anything that improved the existing system or process (Russell & Norvig, 2016).

1.4 Theoretical Understanding of the Technology Adoption

The systematic approach towards the diffusion of innovations can be traced back from 200 years with the studies of French judge and sociologist Gabriel Tarde (The Law of Imitation, 1903). The rudimentary concepts of diffusion S-curve, the universal law of imitation and diffusion, opinion leaders, and perceived compatibility, were initiated though his works (Kee, 2017). The studies of Sauer and Vavilov, Griliches, Everson, Vernon, the green revolution related studies and many others contributed heavily towards the evolution of technology diffusion concepts (Ruttan & Hayami, 1973).

1.4.1 Diffusion of Innovation

The Diffusion of Innovation process was mainly explained with Everett Roger's Innovation Diffusion Theory (IDT) and undergone a serious of revisions through subsequent researches (Rogers, 1995, 2010; Dearing & Cox, 2018). The four key elements of diffusion process are named as innovation, communication channels, time, and the social system (Rogers,1995).

1.4.2 The Teachers' Technology Adoption Process

The education system exposed to the Technology Adoption process as the digital native students were easily learned through the technology frames (Prensky, 2001; McClure et al., 2014). The studies conducted on the use and impact of ICT tools in the teaching-learning process as interactive whiteboards, ICT presentation tools, computer game-based learning, email and e-learning options for both classroom and independent study, the impact of computer systems for education purpose, education management software and virtual learning environments (Livingstone, 2012; Lawrence & Tar, 2018).

1.5 Technology Readiness and Technology Adoption

Parasuraman (2000) has identified that the Technology Adoption is greatly affected by the individuals' disposition towards the technology incorporation. This

Technology Readiness is defined as "the people's propensity to embrace and use new technologies for accomplishing goals in home life and at work. The construct can be viewed as an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine a person's predisposition to use new technologies" (Parasuraman, 2000, p. 308).

1.5.1 Dimensions of Technology Readiness (TR)

The feelings and attitude towards technology are termed as Technology Readiness and is with a combination of the positive and negative beliefs about the technology. The positive aspects of the technology belief drive one towards technology usage while the negative feelings about the technology repel from technology usage (Parasuraman, 2000).

1.5.2 Technology Readiness Index (TRI)

Technology Readiness Index (TRI) is a multiple-item scale to measure the Technology Adoption attitude of the customers and employees. It consisted of two categories as Optimism and Innovativeness. (Parasuraman, 2000). The Four sub-dimensions of the construct are defined as:

- "Optimism—a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives.
- Innovativeness—a tendency to be a technology pioneer and thought leader.
- Discomfort—a perceived lack of control over technology and a feeling of being overwhelmed by it.
- Insecurity—distrust of technology, stemming from skepticism about its ability to work properly and concerns about its potentially harmful consequences" (Parasuraman & Colby, 2015, p. 60).

1.6 Barriers of Technology Adoption Process

A barrier is defined as a problem, rule, or situation that prevents someone from doing something, or that makes something impossible (Barrier, 2019). Educational Technology Barriers are those stumbling blocks that create interrupted permeability of the educational technology at any stage of the

Technology Adoption Process (Schoepp, 2005). Several barriers are affecting the Technology Adoption of the teachers as socio-cultural factors, personal factors, technology factors, economic factors, pedagogy-psychological factors, demographic factors, etc. (Rogers, 2000; Carver, 2016).

1.6.1 External and internal Technology Barriers

Technology Barriers are classified as external and internal. External Barriers are termed as first-order barriers and the internal barriers as second-order barriers. Internal Technology Barriers are those teacher-specific psychological dispositions towards the technology as teacher attitude, technical skill level, technology anxiety and perception about the technology (Schoepp, 2005; Carver, 2016; Makki, O'Neal, Cotten, & Rikard, 2018). Lack of effective utilization of the available time frame, non-judicious utilization of the financial and nonfinancial resources, non-availability of customer support systems are major barriers in this category (Rogers, 2000; Schoepp, 2005; Carver, 2016; Makki et al., 2018)

1.6.2 Teachers' Technology Adoption- first-order barriers

Technology Barriers of the teachers prevent or reduces the adoption of the education technology. They are due to the lack of accessibility of the teaching technology platforms, inadequate technology support systems in education scenario, the inadequacies in the teacher training and technology development programs (Pajo & Wallace, 2007; Al-Gamdi & Samarji, 2016).

1.6.3 Perceived Barriers of Technology Adoption

The teachers with less Technology Readiness perceive the barriers as the most discouraging hurdles of the Technology Adoption, whereas those with technology innovative minds tend to overcome this perceived barrier with alternative resources as personal computers, mobile gadgets, self-training student support groups etc. (Al-Gamdi & Samarji, 2016). Kotrlik and Redmann (2009) included categories of first-order Technology Adoption barriers in a scale as the availability of time, technology availability, technical support, availability of the scheduled time for the technology usage, development factor of the staff, and the administrative support. Technology

Barrier variable is defined as any factor that prevents or restricts teachers' use of technology in the classroom (Redmann & Kotrlik, 2009).

1.7 Technology Anxiety on Technology Adoption

Technology anxiety is the undue fear or restlessness one experiences due to the interaction with computer systems or similar technology products. Technology anxiety connected with computer anxiety and technostress (Setyarini, 2018). Technology Anxiety has a moderate negative association with the teachers' Technology Adoption and was defined as an apprehensive feeling when faced with the possibility of using a new technology (Meuter et al., 2003; Gelbrich & Sattler, 2014).

1.8 Technology Adoption Scale

The Technology Adoption as per the education change model of Fullan (2007) is usually accomplished through the stages of adoption, implementation, and continuation. Technology Adoption is defined as the stage in which technology is selected for use by an individual or an organization (Redmann & Kotrlik, 2009). The fifteen-item Technology Adoption scale developed by Kotrlik and Redmann (2009) was adopted to measure the Technology Adoption of the teachers. This instrument has proven validity and reliability across the multi-cultural contexts (Redmann & Kotrlik, 2009; Bahçekapili, 2018).

1.9 Technology Exposure and Technology Use on Technology Adoption

Providing teachers exposure to digital programs, training, and technology tools increases their technology adoption (Hutchison & Woodward, 2018). The Technology Exposure of the teachers are measured with respect to their technology familiarity, technology training, duration of the technology use at workplace and at home (Redmann & Kotrlik, 2009)

The monitored Technology Use accelerated Technology Adoption, participatory digital learning culture, enhanced higher order of learning skills and reduced the reach-out problems beyond the academic timings (Greenhow &

Lewin, 2016). The instructors' learning Technology use categorized as social media use, technology for general purposes, and for teaching purpose (Gruzd et al., 2019; Almansour, 2019).

2. NEED FOR THE STUDY

Many studies have proved that Technology Barriers and Technology Anxiety negatively influenced teacher's Technology Adoption process. And Technology Readiness, Technology Exposure and Technology Use fostered their Technology Adoption (Parasuraman, 2000; Redmann, 2004; Redmann & Kotrlik, 2009). The post-millennium earmarked with integrated social media use and the other aligned technology platforms, which eventually supported the technology invasion. Thus, an integrated study needed to assess the Technology Adoption process with respect to Technology Readiness, Technology Exposure, Technology Anxiety, Technology Barriers, and Technology Use with respect to the technology-enabled education process of Kerala. This study was conducted in Kerala since the State of Kerala could achieve tremendous technology incorporation in the education system.

Studies to address teacher's Technology Adoption with respect to Technology Readiness and related factors were in flux. And these Technology Adoption studies were limited to the scope of exploring the impact of a couple of individual factors of the Technology Adoption process and it also has an objective to integrate different conceptual frames of Technology Adoption. So, this study integrates different factors that influence the HSS Teacher's Technology Adoption process in the school sector and also intend to provide a Technology Adoption process model for future studies.

3. REVIEW OF LITERATURE

3.1 Introduction

The studies referred were mostly of 1995-2020 period and arranged under Technology Adoption and other study variables.

3.2 Studies Related to Technology Readiness

The Technology Readiness concept proposed by Parasuraman (2000) were widely used to measure the Technology affinity of the people. He termed his scale as the Technology Readiness Index 1.0, a 36-item scale to measure 'people's propensity to embrace and use cutting-edge Technologies' in their life and in 2015 scale was updated to TRI 2.0. This study was based on the Diffusion of Innovation framework and appreciated in technology research circles as valid in transcontinental contexts. The reviews given below were related to the Technology Readiness and connected with mediating variables of the Technology Adoption Process. The hypothesis related TR was identified from these.

The preliminary understanding of Technology Readiness Levels was introduced around the 1970s. The nine TR Levels of the technology maturation periods were strengthened and clearly articulated. These TR levels were named as TRL1 to TRL9. TRL1 is the lowest level of technology process where the TRL9 is the fulfilment of the maturation process (Mankins, 1995, 2009). Damerji (2020) identified that Technology Readiness was positively contributed towards the Technology Adoption. The study also concluded that the Technology Readiness positively influenced Technology Use. The mediation analysis showered that the technology features mediate the relationship between the TR and Technology Adoption.

The study on Technology Adoption characteristics as optimism, discomforts, innovativeness, and insecurity with cognitive factors of the TAM model revealed the critical influence of the technology anxiety, barriers, technology use on the adoption of the technology in the teaching process at the African Schools (Setati, & Paledi, 2019). The study by Hamsan, Aziz, and Taslim (2018) identified that the optimism dimension of the TRI has a greater relationship with the teachers' technology barriers. The Technology Adoption in schools was influenced by the Technology Readiness of educator, student and learning environment of the schools. Petko, Prasse, and Cantieni (2018) affirmed that educational technology imparting is dependent primarily on the individual

teachers' Technology Readiness. Teachers' perceived technology skills and barriers considerably influenced their implementation process. The cross-sectional survey study of Alfy, Gómez, and Ivanov (2017) affirmed the role of TRI in shaping teachers' technology attitudes, technology-based interaction with students, and their intentions towards technology use. The technology infrastructure, autonomy, institutional technology policies and regulations were significant in e-learning. The direct relation of Technology Adoption and TRI, the technology training was affirmed by Hand (2016)

Parasuraman and Colby (2015) updated the new scale for measuring the TRI and named as TRI 2.0 with 16-items to measure the 'people's propensity to embrace and use cutting-edge Technologies'. The TRI 2.0 scale and segments proposed in this were adopted for this study. Technology Readiness is taken as the predictor variable of the Technology Adoption. This was reaffirmed by Lin, Chu-Liang, and Lee (2015) that affirmative aspect of Technology Readiness -optimism and innovation- has considerably contributed for the technology adoption. The Optimism element of the TRI had contributed (44%) to towards the Technology Adoption of the teachers.

The Technology Readiness and 'Innovation' dimension of the TRI was more predominant predictor of adoption influenced by gender, race and experience under the study condition (David, 2015). The longitudinal research on Technology Readiness (TR) affirmed that the innovativeness and optimism predicted the willingness to adopt technology greatly. The group interactions, technology training, and facilitators' interactions can improve technology affinity (Grindle 2014). Ho (2009) affirmed that TRI predicted the learning behaviour, learning outcomes and Technology Barriers. Roper (2006) affirmed that the TRI is strong predictor of the technology usage of the teachers and their satisfaction related to technology-based teaching are significantly related with their TRI.

From these research reviews, it was hypothesised that TRI and its sub-dimensions were significantly predicted Technology Adoption in positive manner. TRI was negatively influenced the Technology Barriers, Technology Anxiety and

positively with Technology Use. The TRI measuring scale was tested in transcontinental contexts. TRI has differed with age, gender, experience, qualification and training.

3.3 Studies Related to Technology Adoption, Technology Use, and Technology Exposure

A systematic approach to technology incorporation in education initiated with the United States' Federal report (1993). The theories on the Technology Adoptions were systematically evolved with the initial proposal of Diffusion Innovation Theory (IDT) of Roger (1971) and with the later elaborate study in 1995. IDT addressed the diffusion process of the technologies with respect to Scio-cultural background and technology features with respect to time. The multiple theories of adoption as Theory of Reasoned Action (TRA), Technology Adoption Models (TAM1, TAM2, TAM3), Unified Theory of Acceptance and Use of Technology (UTAUT), Technological Pedagogical Content Knowledge (TPACK) were addressed the different aspect of the Technology Adoption, discussed in the theoretical part of this study. As the Technology Adoption studies are broad in nature, this session of the review of the literature is limited to identify the relations of study variables and those studies connected with the research tools proposed by Kotrlik and Redmann (2009).

The meta-analytic of Scherer, Siddiq, and Tondeur (2020) with sample of 37211 teachers confirmed that the Technology Adoption constraints were substantially intercorrelated. This study emphatically rejected the long hold assumption that the Technology Adoption was positively and significantly correlated with the intension to use technology. This study affirmed that technology adoption is connected with TR, Technology Use and reduced with barriers. Sun and Gao (2019) identified that school leadership is critical in the technology implementation process, technology use and affirmed the teachers' role in technology-enabled learning as learners. Gruzd, Haythornthwaite, Paulin, Gilbert, & Del Valle, (2018) affirmed the moderate use of modern media for contemporary teaching purpose related to communities of practice.

Karsh (2018) affirmed that the Technology Adoption is predicted by Technology Barriers, technology availability and training, the technology anxiety. Technology availed freely among the teachers, which reduced their technology anxiety. Gender, age, experience were not significant predictors of the Technology Adoption. McClure et al., (2014) identified that the impact of barriers, anxiety, age, gender, years of experience, and training on Technology Adoption was not countable. The complex technologies increased Technology Barriers and Technology Anxiety (Roberto, 2013).

Redmann and Kotrlik (2004) identified four phases of Technology Adoption as Exploration, Experimentation, Adoption, and advanced integration from Fullan's model. The scales of the research were developed with exemplary validity and reliability. Based on the triple staged education change model of Fullan (2007), they formulated a scale for the Technology Adoption studies with predicting variables as Technology Barriers and Technology Anxiety and Technology Use. He affirmed that the technology training, gender, age and teaching experience has a significant influence on the Technology Adoption of the teachers (Kotrlik & Redmann, 2009). Technology Barriers and Technology Anxiety has a negative impact on Technology Adoption. The demographical variables as gender, age, experience etc have only indirect influence on Technology Adoption. This study was initiated from the 5year trend study (Redmann & Kotrlik, 2008). The scales, hypothesis and variables were basically adopted from these studies. The Technology Adoption was fostered by the role modelling effect, faculty involvement in technology decision-making, provision of training for support personnel, technical support and was retarded due to anxiety, time and attitudinal barriers of Technology Adoption (Parisot, 1995). Gender, age, specializations have a nominal influence on technology adoption, Technology Use. Technology Exposure was rather independent predictor of Technology Adoption. The related hypothesises were evolved from these research studies.

3.4 Studies Related to Technology Barriers and Technology Adoption

The presence of the barriers blocks the successful implementation of educational technologies. However, Technology Barriers were always present in education systems (Schoepp, 2005). The Barriers are due to differences in socio-cultural, personal dispositions, technology features, economic factors, pedagogy related, psychological dispositions, demographic factors etc. (Rogers, 2000; Carver, 2016). This session of the literature review was to identify the role of barriers and the associated factors with respect to the Technology Adoption Process. The Technology Barriers studied by Kotrlik, Redmann, and Douglas (2003), Redmann and Kotrlik (2004), Redmann and Kotrlik (2008), Kotrlik and Redmann (2009), McClure et al. (2014), Karsh (2018).

The study on teachers' Technology Adoption indicated the internal Technology Barriers were influencing their outlook, had a high predictive role on the adoption of m-Learning platforms; a hedonistic and utilitarian aspect (Sánchez-Prietoa et al., 2019). The teachers with innovative attitude deliberately found methods to overcome the Technology Barriers and availed the required support systems from school. This study affirmed mediation aspect of the technology anxiety and barriers. Their high technology affinity reduced technology anxiety and perceived Technology Barriers as they supported with apt training. The external barriers as lack of technology, restricted internet access, and a lack of administrative and technical support were found to be the major impediments of Technology Adoption (Kilinc, Tarman & Aydin, 2018).

Nikolopoulou and Gialamas (2016) reported that slight variations in barriers were noted across the categories of gender, subject specialization and experience. Teachers' confidence in using technology (Technology Readiness) was a significant factor that resulted in higher Technology Adoption. Kopcha (2012) revealed that situated professional technology development training programs could be critical in shaping the teachers' attitudes towards the perceived Technology Barriers. Proper mentoring and technology implementation visions were positively lined with Technology Adoption. Wallace (2012) revealed that

there is no significant difference between the first order and third-order barriers with respect to the age groups. But the barriers related to skills and attitude (second-order) were significantly different across the generations. Wachira and Keengwe (2010) identified teachers' internal barriers of integration as lack of time, lack of technical knowledge, lack of confidence in using technology, technology anxiety, distrust on the technology, teachers' technology dispositions.

Al-Senaidi, Lin, and Poirot (2009) concluded that the perceived Technology Barriers were contextual in nature and major barriers of Technology Adoption were identified as lack of equipment, lack of proper institutional support, disbelief of technology benefits, lack of confidence, and lack of time. Patricia Rogers (2000) brought to light that technology integration is accelerated through a positive affinity towards technology (Technology Readiness).

These researchers, in general, agrees the mediating role of Technology Barriers on technology integration. The barriers were mildly associated with gender, age and other professional roles. The barriers were reduced with training, administrative support to reduce anxiety, innovation and TR. Barriers were reducing thee technology use of the teachers. The hypothesises were framed based on these findings.

3.5 Studies Related to Technology Anxiety on Technology Adoption

Many terms were used interchangeably by the researchers to address the negative attitude towards computer-based technology platforms as technology anxiety, computer anxiety, technology stress, computer stress, computer phobia, technostress and technophobia. The prefix 'technology' used (as Technology Anxiety, technophobia) to indicate that the technological platforms are holistically considered, without differentiation to individual technology platforms as a computer, mobile, internet, software etc. (Schlebusch, 2018; Njiku, Maniraho, & Mutarutinya, 2019). Technology Anxiety was considered as the part of the technology attitude of the persons, but due to the spread of the technology-based researches, the Technology Anxiety was later considered as a separate entity from an attitude that affected the Technology Adoption of the individual (Park, Ahn,

Thavisay, & Ren, 2019; Njiku et al., 2019). Technology anxiety became strongly manifested when the faculty were asked to use novel technologies or to experiment with the undiscovered features of the technology (Kotrlik & Redmann, 2009; Redmann & Kotrlik, 2004).

Parka, Ahnb, Thavisaya and Ren (2019) identified that the Technology anxiety negatively influenced technology use as the mobile payment systems, adoption process by inflicting doubt on the security. The initial anxiety made the customers careful about the transactions, and the familiarity with the features made them confident and the anxiety got reduced with respect to regular use. Nandang and Budiman (2019) concluded that the frequent use of computer has reduced computer anxiety which was negatively related to Computer Attitude and Computer Self Efficacy.

Holzmann, Schwarz, and Audretsch (2018) revealed that the Technology Adoption of the teachers was predicted by expectancy, technology anxiety, attitude toward using technology, and technology use. Technology anxiety was the second predictor which negatively influenced the intension to use technology. Attitude towards technology was the third predictor of the technology use. The technology anxiety associated with the learning and teaching with Tablet PC was studied by Öztürk (2018). The teachers expressed their anxiety due to the fear of perceived breakdown during the sessions, fear in using it properly and anticipated breaking of tablet PCs. They expressed their lack of experience, exposure with the technology and believed that they will lose control over the sessions. The technology anxiety was more associated with the senior teachers and female teachers' anxiety was found to be a little higher than the male teachers. The study by Schlebusch (2018) identified that the less anxiety and high computer self-efficiency were fostering the technology use/adoption. The high computer self-efficiency reduced the anxiety and improved the Technology Adoption.

Awofala, Akinoso, and Fatade (2017) concluded that the computer anxiety of the teachers was contributed by the factors related to their computer self-efficiency, perceived control, perceived usefulness and the affective element

towards the use. This attitude to embrace the technology (Technology Readiness) reduced their computer barriers. Setyarini (2015) researched that the technology anxiety factors needed to be addressed training and through getting support from the peers, technicians and even from the techno-savvy students; individual prepared ness and self-motivation; and finally, overall institutional support.

Johnson, Wisniewski, Kuhlemeyer, Isaacs, and Krzykowski (2012) identified that the involvement of the faculty in technology design through planning, evaluating, and hands-on experiences in technology use were helpful in reducing the technology anxiety of the teachers. Miller (2010) researched that there was a significant relationship between teachers' anxiety with age and years of teaching experience. It was found that the gender difference was vivid among the teachers' technology liking and technology confidence. Rogers (2007) identified that gender and subject were not significantly influenced the teachers' technology anxiety or innovativeness. A negative relationship was found between the teachers' technology innovativeness, computer anxiety and technology integration. Technology training had a significantly reduced teachers' technology-based anxiety. These researchers affirmed the retarding nature of Technology Anxiety on adoption process and Technology Use. The Technology Anxiety was associated in many studies with demographic factors and reduced with TRI and Technology Exposure through training. Technology Barriers also predicted by the Technology Anxiety. These associations were taken to form the research hypothesises.

3.6 Research Gap

The review of literature affirmed the existence of multiple predictors for teachers' Technology Adoption. Technology Readiness (TR) aspects positively contributed to the adoption process. Technology Anxiety and perceived Technology Barriers of Teachers' significantly inhibited their Technology Adoption process. Technology Exposure and Technology Use accelerated the adoption process.

The Technology Barriers were found to be reduced with Technology Exposure due to the technology training. The Optimism and Innovation aspects of the TR were negatively related with perceived Technology Barriers. Researches on the Technology Anxiety confirmed that Technology Anxiety of educators can reduce their Technology Adoption Process. Technology Anxiety can increase Technology Barriers and which in turn reduce the Technology Adoption. Technology Anxiety reduced due to the Technology Exposure. However, these studies mostly concentrated around the individual dimensions and could explain only certain specific aspects of the Technology Adoption. Thus, a study addressing these multiple theoretical aspects was needed to have a rather complete understanding of the Technology Adoption process of the teachers.

The present study was an attempt to fill this research gap by addressing those relevant aspects that could successfully explain the Technology Adoption process through the relevant predictors as Technology Readiness, Technology Exposure, Technology Anxiety, Technology Barriers, and Technology Use.

4. STATEMENT OF THE PROBLEM

The multiple aspects of Technology Adoption needed to be effectively incorporated in the education system. A study on the impact of factors that influence teachers' Technology Adoption process can provide a vivid understanding on Technology Adoption to optimize the education technology implementation process by adopting apt strategies. Hence, the present study 'Influence of Technology Readiness and Technology Barriers on Technology Adoption by Teachers' was undertaken by the researcher to examine the critical issues of how Technology Adoption is influenced by Technology Readiness, Technology Exposure, Technology Anxiety, perceived Technology Barriers and Technology Use?

4.1 Research Questions

Based on the statement of the problem, the following research questions were formulated for this study.

1. Is Technology Adoption influenced by Technology Readiness and its sub-dimensions, Technology Exposure, Technology Anxiety, Technology Barriers and Technology Use among Higher Secondary School teachers?
2. Do demographic factors make a difference in the Technology Adoption, Technology Readiness, Technology Exposure, Technology Anxiety, Technology Barriers and Technology Use among Higher Secondary School teachers?

4.2 Objectives of the Study

Based on the statement of the research problem and the research questions, the following study objectives were identified to frame this research.

1 To study the influence among Technology Adoption, Technology Readiness and its sub-dimensions, Technology Exposure, Technology Anxiety, Technology Barriers, and Technology Use by Higher Secondary School teachers

2 To identify the differences in Technology Adoption, Technology Readiness, Technology Use, Technology Anxiety, Technology Barriers, and Technology Use by Higher Secondary School teachers with respect to their demographical features

3 To study the mediating role of Technology Anxiety and Technology Barriers in the relationship between Technology Readiness and Technology Adoption by HSS teachers.

4 To examine the role of Technology Use and Technology Exposure in the relationship between Technology Readiness and Technology Adoption by HSS teachers

4.3 Scope of the Study

The educational technology incorporation initiated in State of Kerala with IT@school project and later it was systematically reorganized under the KITES, Kerala. Presently the pre-university educational technology leadership of the State of Kerala is coordinated through the KITES and the centre syllabus schools also

joins with this educational technology implementation process. The teachers are the channels of educational technology implementation process and their Technology Adoption is very critical for the effectiveness of this process. HSS teachers play a critical role in the students' Technology Adoption process as they are educating the students just before their university education.

The present study investigates the teachers' Technology Adoption process in HSSs. The dependent variable was Technology Adoption and the independent variables were Technology Readiness, Technology Exposure, Technology Anxiety, Technology Barriers and Technology Use. The demographical factors were gender, age, school type, educational district, qualification, specialization, teaching experience, training of the HSS teachers. Based on the theories of Diffusion of Innovation, Communities of Practice and Education Change Model this study investigates the education Technology Adoption of teachers in HSSs.

This study followed a descriptive research with quantitative data. Standardised questionnaires adopted from the researches were administered by the researcher among HSS teachers of three civil districts categorized as economically backward civil district, tribally preferred district and a non-categorized civil district at the Northern part of Kerala. The permission for data collection was obtained from KITES, Kerala during March 2019 and extended till June 2019. Subsequent permissions were obtained from the principals, management, and informed consent was sought from the teachers.

The data of 1029 HSS teachers were used for the analysis. The data were analyzed through t-test, Analysis of Variance, normality tests, mean, percentage, standard deviation analyses. The correlation and regression, moderation, and mediation were done. The data primarily analyzed with Statistical Package for Social Sciences (SPSS v.21) to test the hypothesis. The mediation and moderation analysis tested with PROCESS v. 3.4 macro for SPSS v.21 by Andrew F. Hayes. Implications drawn from findings along with the direction for future researches.

5. VARIABLES OF THE STUDY

- Dependent variable: Technology Adoption
- Independent variables: Technology Readiness and its sub-dimensions
  Technology Exposure
- Mediating variables: Technology Anxiety
  Technology Barrier
  Technology Use

5.1 Demographical Variables of the Study

- Gender
- Age
- School type
- Educational district
- Qualification
- Specialization
- Teaching Experience
- Training

6. OPERATIONAL DEFINITIONS

6.1 Variables with Operational Definition

1 Technology Adoption:

In the present study Technology Adoption refers to the stage in which technology is selected for use by an individual or an organization (Redmann & Kotrlik, 2009).

2 Technology Readiness:

In the present study Technology Readiness refers to People's propensity to embrace and use new technologies for accomplishing goals in home life and at work. It is measured with TRI scale (Parasuraman, 2000; Parasuraman & Colby, 2015).

Technology Readiness Index (TRI) 2.0: TRI is the index to denote people's propensity to embrace and use cutting-edge technologies (Parasuraman & Colby, 2015). (It is measured through four subdimensions as given below)

Optimism: ''Optimism is a positive view of technology and a belief that offers people increased control, flexibility, and efficiency in their lives'' (Parasuraman & Colby, 2015, p.60).

Innovation: ''Innovation is a tendency to be a technology pioneer and thought leader'' (Parasuraman & Colby, 2015, p.60).

Discomfort: ''Discomfort is a perceived lack of control over technology and a feeling of being overwhelmed by it'' (Parasuraman & Colby, 2015, p.60).

Insecurity: ''Insecurity is the distrust of technology, stemming from skepticism about its ability to work properly and concerns about its potential harmful consequences'' (Parasuraman & Colby, 2015, p.60)

3 Technology Exposure:

In the present study Technology Exposure refers to cognitive and practical technology training and technology usage for pedagogical purpose (Redmann & Kotrlik, 2009)

4 Technology Anxiety:

In the present study Technology Anxiety refers to.an apprehensive feeling when faced with the possibility of using a new technology (Meuter et.al., 2003; Gelbrich & Sattler, 2014)

5 Technology Barrier:

In the present study Technology Barrier refers to any perceived factor that prevents or restricts teachers' use of technology in the classroom (Redmann & Kotrlik, 2009)

6 Technology Use:

In the present study Technology Use refers to self-reported use of technology facilities for social, informational and pedagogical purpose (Redmann & Kotrlik, 2009; Gruzd et al., 2019)

6.2 Demographic variables

In the present study demographic variables refers as given below:

- Gender: Male/Female.
- Age: recorded in years as on 1st Jan 2019.
- School type: Government, Aided, Unaided, CBSE/ICSE/other.
- Educational district: Kannur, Thalassery, Wayanad, Thamarassery, Kasaragod, Thaliparamba, Kanhangad.
- Qualification: Highest qualification as on date of data collection.
- Specialization: Specialisation taken for highest qualification.
- Teaching Experience: recorded in months as on 1st Jan 2019.
- Training: Technology Training undergone within a year:

6.3 Higher Secondary School

In the present study Higher Secondary Schools refers to Schools that provide XI and XII standards of education.

7. RESEARCH HYPOTHESIS

Based on the review of the literature, and objectives of the study, the following research hypothesises were identified.

1. There is relation between Technology Adoption and Technology Readiness and its sub-dimensions, Technology Exposure, Technology Anxiety, Technology Barriers, Technology Use by Higher Secondary School teachers
2. There are differences in Technology Adoption, Technology Readiness, Technology Exposure, Technology Anxiety, Technology Barriers and Technology Use by HSS teachers with respect to their demographic factors
3. Technology Anxiety and Technology Barriers has mediating role on Technology Readiness to Technology Adoption by HSS teachers.
4. Technology Exposure and Technology Use has mediating role on Technology Readiness to Technology Adoption by HSS teachers.

These research hypotheses are general in nature and are directly derived from the objectives based on the review of the literature. These research hypothesizes are tested during the analysis after splitting them into testable units.

8. RESEARCH DESIGN

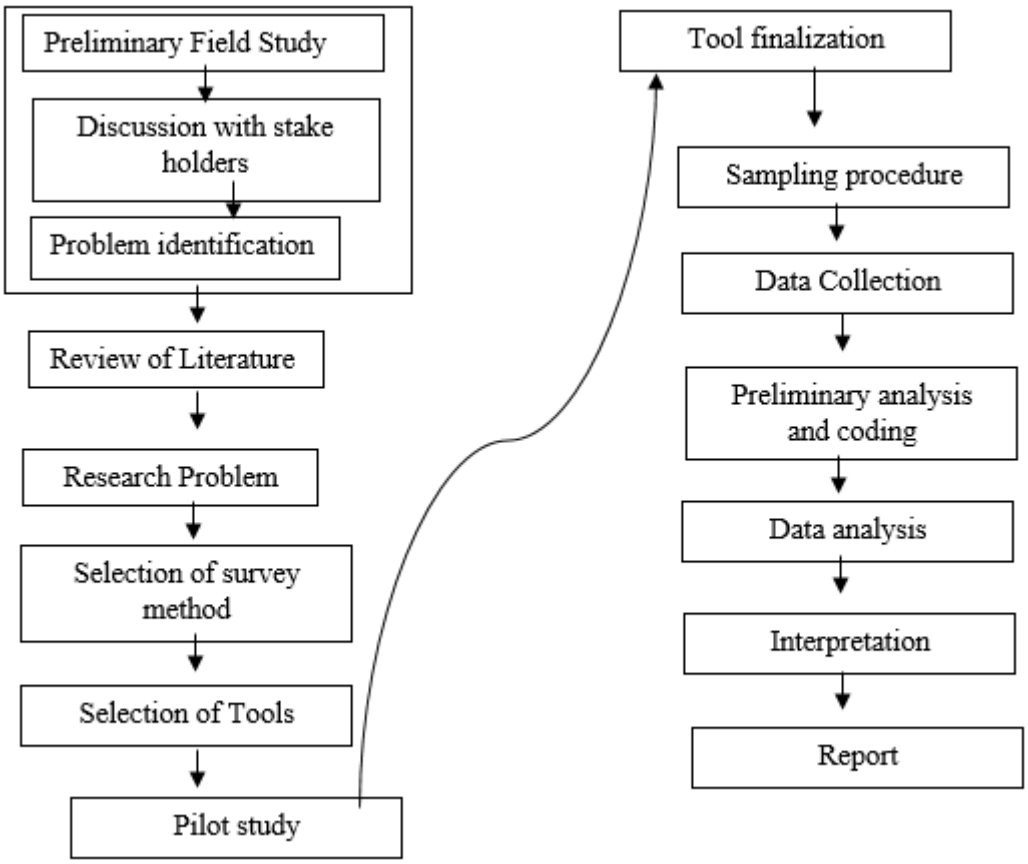

Figure 1: Proposed Research Design

9. SAMPLING DESIGN

9.1 Type of Research

The present study used descriptive research (Bryman & Bell, 2010) with survey method for data collection (Bhattacherjee, 2012).

9.2 Population and Sample Frame

The population of this study consisted of 74400 HSS Teachers of the State of Kerala, India. The population consisted of teachers from Government Schools, Government Aided Schools, Unaided schools and Centre Syllabus schools.

Sampling frame consisted of 7100 HSS Teachers of the Kannur, Kasaragod and Wayanad revenue districts of Kerala. Wayanad revenue district was with a tribal minority status situated fully in the Western Ghats, the Kasaragod was with financial backward status and the Kannur were without any special privileges. These revenue districts consisted of six educational districts.

9.3 Sampling Technique

Cluster sampling model was used to collect the data from HSSs

9.4 Sample Size

1029 samples were used for this study. The sample size for the finite population can be found by the "formula: n = N*X / (X + N – 1), where, X = Zα/22 *p*(1-p) / MOE2, and Zα/2 is the critical value of the Normal distribution at α/2 (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96), MOE is the margin of error, p is the sample proportion, and N is the population size. The Finite Population correction has been applied to the sample size formula" (Daniel, 1999, pp. 141-142). The application of this formula gave a sample size of 904 with 99% confidence level and 4% margin of error (with 5% margin of error the sample size was estimated as 601). However, a bigger sample was adopted for this study than the calculated one.

9.5 Method of Data Collection

The data collection was done with structured physical questionnaires in survey model by the researcher. An initial short discussion was made with teachers before the administration of the instruments and post tool administration feedback were also made with the teachers.

10. TOOLS FOR COLLECTING THE DATA

- Technology Adoption scale by Kotrlik and Redmann (2009).
- Technology Readiness Index- TRI 2.0 by Parasuraman & Colby (2015).
- Technology Exposure scale by Kotrlik and Redmann (2009).

- Technology Anxiety scale by Kotrlik and Redmann (2009).
- Technology Barrier scale by Kotrlik and Redmann (2009).
- Technology Use scale by Gruzd et al. (2019).

10.1 Description of the Scales

- Technology Adoption Scale: This fifteen-item scale developed to measure the education Technology Adoption of the teachers through the stages of adoption, implementation, and continuation (Kotrlik and Redmann, 2009).
- Technology Readiness Index- TRI 2.0 is 16-item scale used for measuring the Technology Readiness of the teachers. It has 4-subdimensions as Optimism, Innovation, Discomfort, and Insecurity. (Parasuraman & Colby, 2015).
- Technology Exposure is a four-item scale for measuring the technology trainings and exposure of teachers (Kotrlik and Redmann, 2009).
- Technology Anxiety scale is a 12-item scale to measure the apprehensive feeling when faced with the possibility of using a new technology (Kotrlik and Redmann, 2009).
- Technology Barrier is a 7-item scale for measuring the perceived first order barriers that prevents or restricts teachers' use of technology in the classroom (Kotrlik and Redmann, 2009).
- Technology Use is the 21-item scale to measure the self-reported use of technology facilities for social, informational and pedagogical purpose (Gruzd et al., 2019)

11. VALIDATION PROCEDURES

The tools used in this study was adopted from the standardised tools. A pilot study was conducted on 122 HSS teachers to establish the reliability of the standardized instruments and Cronbach's alpha for the respective scales used in this study are given in table 1. The survey instruments were accepted as reliable and adequate for conducting the study under the specified population (Tavakol & Dennick, 2011).

Table 1: Cronbach's alpha of Instruments

	Variables	Cronbach's Alpha	No of items
1	Technology Adoption	0.865	15
2	Technology Readiness TRI 2.0	0.646	16
3	Technology Exposure	0.688	4
4	Technology Anxiety	0.909	12
5	Technology Barriers	0.757	7
6	Technology Use	0.868	21

12. FIELD WORK DETAILS

The researcher conducted a preliminary field study on technology adoption process of HSS Teachers from the Kannur and Kasaragod revenue districts. Discussions were made with teachers, Managers, Principals, technology trainers, of HSSs. 80 students from different school sectors participated in focus group discussions regarding the technology implementation and expressed their concepts related to the technology-based teaching- learning process. These field studies were useful in understanding the strengths and issues of the technology-based education at HSSs and were supportive of research problem identification.

13. TOOLS FOR ANALYSIS

The data entry and analysis were done with Micro-Soft Excel-2016 spread sheet, IBM SPSS Statistics v.21, PROCESS v. 3.4 macro for SPSS v.21.

Descriptive analysis was done with mean, variance, percentage analysis and tests of inter-dependency and variation of the means were done with t-test for independent samples, Analysis of Variance. Relationship and influence were analysed with correlation, regression, moderation, and mediation analysis.

14. FINDINGS AND DISCUSSIONS

This section of the synopsis is devoted for the summarization of the findings of the data analysis.

14.1 Descriptive Statistics of the Data

The 1029 responses from HSS teachers were taken for analysis and were PG qualified permanent teachers. The respondents consisted of 67.3% female teachers, 40.8% were aged below 40years, 63.5% were with more than 10years of experience. 36.9% were with arts specialization, 25.9% science, 21.3% were with language and 15.8% were with commerce streams. The data distributed is across the six educational districts and the data is assumed to be normal with respect to skewness (+0.38, -0.858) and kurtosis (+1.267, -0.426). So, parametric test was employed for analysing the data.

14.2 Results of Correlation

The correlation between Technology Adoption and Technology Readiness showed a weak positive relationship (r=0.250, *p*=0.000) which was statistically significant and two of its sub-dimensions (Optimism, r=0.430, Innovation r=0.341) were positively correlated. And while the other two dimensions (Discomfort, r= -0.078 and Insecurity, r= -0.210) were negatively correlated. There was weak relationship between Technology Adoption and Technology Exposure (r= 0.352, *p*=0.000), Technology Anxiety (r= -0.152, *p*=0.012), Technology Use (r=0.143, *p*=0.000) and moderate negative correlation with perceived Technology Barriers (r= -0.528, *p*=0.000) of the HSS Teachers.

There was negligible correlation between Technology Readiness and Technology Exposure (r= 0.094, *p*=0.002), Technology Anxiety (r= -0.078, *p*=0.012), Technology Barriers (r= -0.223, *p*=0.000), Technology Use (r= 0.192, *p*=0.000) of the HSS teachers. There was a weak correlation between Technology Anxiety and Technology Barriers (r= -0.147, *p*=0.000), Technology Use (r= -.073, *p*=0.020) of the HSS teachers.

There was weak and statistically significant negative correlation between Technology Barriers and Technology Use (r= -0.122, *p*=0.000) of the HSS Teachers. The first research hypothesis was accepted to state that there was relationship between the Technology Adoption and its predictors.

14.3 Results of Regression Analysis

The Technology Adoption of the HSS teachers predicted by Sub-dimensions of TRI as Optimism, Innovativeness, Insecurity, and Discomfort (R^2=0.260, F (4, 1024) =89.771, p= .000). The Technology Adoption predicted by sub-dimensions of Technology Use -Technology General, Technology Teaching, and Social Media Use (R^2=0.035, F (3, 1025) =12.532, *p*= .000). The Technology Adoption of the HSS teachers predicted by Technology Readiness, Technology Anxiety, and Technology Barriers (R^2=0.306, *F* (3, 1025) =150.763, *p*= .000).

14.4 Test of Significance of Demographical Factors on Study Variables

There was no significant difference with respect to the gender of respondents on their Technology Adoption, Technology Readiness Index, Technology Exposure, Technology Anxiety, Technology Barriers, Social Media Use, Technology use for general purpose, and Technology use for teaching purpose ($p>0.05$).

There was significant difference between school sectors regarding the Technology Barriers (ANOVA, F (3,1025) = 2.821, p = 0.038). The Tukey post hoc test showed that the Technology Barriers were more in teachers of centre sector schools (μ=2.56, σ=0.628, p = 0.038) when compared with the aided sector (μ=2.40, σ=0.653) schools. There was no significant difference between the Technology Barriers of teachers with respect to the other school sectors.

There was no significant ($p>0.05$) difference between the different school sectors with respect to Technology Adoption, Technology Readiness Index, Technology Exposure, Technology Anxiety, Technology Use. There was no significant difference ($p>0.05$) between teachers of different age group with respect to their Technology Adoption, Technology Barriers, Technology Anxiety and Technology Use. The internet use (at home) had ($p<0.05$) differed teachers' Technology Adoption, TRI, Tech Barrier (p=.050), Social Media use and Technology Use.

There was significant difference ($p<0.05$) among the age group of the teachers with study variables. There was no significant difference ($p=0.481$, i.e. $p>0.05$) among different internet usage categories with respect to their Technology Anxiety. There was no significant difference ($p>0.05$) among the respondents with respect to their specialization and academic qualifications. Thus, second research hypothesis was not accepted and affirmed that there was no significant difference among the HSS teacher with respect to their demographical variations.

14.5 The Mediation Analysis

The independent variable Technology Readiness negatively predicted Technology Barriers through partial mediation of Technology Anxiety ($R^2=0.306$, $\beta= -0.4029$, Boot SE= 0.054, $p=0.000$) of the HSS Teachers. Technology Readiness predicted Technology Adoption through partial mediation of Technology Anxiety ($R^2=0.092$, $\beta=0.2179$, $p=0.000$) of the HSS Teachers.

Technology Readiness predicted Technology Adoption of the HSS Teachers through partial mediation ($\beta= 0.1726$) of Technology Barriers ($R^2=0.298$, $\beta=0.4016$, $p=0.000$). The Technology Readiness predicted Technology Adoption of the HSS Teachers with sequential mediatory path through Technology Anxiety and Technology Barriers ($R^2=0.306$ $\beta=0.381$, $p=0.000$).

Technology Adoption was predicted by Technology Exposure through a partial mediation of Technology Anxiety ($R^2=0.132$, $\beta=112$, $p<0.05$) of the HSS teachers. Technology Adoption was predicted by Technology Exposure through partial mediation of Technology Barriers ($R^2=0.302$, $\beta=0.2264$, $p<0.05$).

Technology Adoption was predicted by Technology Exposure with a sequential mediation of Technology Anxiety and Technology Barriers ($R^2=0.305$, $\beta=0.2376$) affirmed (MSE=0.2444, F (3,1029) = 149.7624, $p=0.000$). Through these analyses the 3rd research hypothesis was accepted.

14.6 Findings Related to the Impact of Technology Exposure and Technology Use on TRI to Technology Adoption

The Technology Exposure negatively moderated (R^2=0.171, β= -0.1186, se= 0.0446, p= 0.0079) the TRI to Technology Adoption. Technology Use mediated partially the TRI to Technology Adoption (R^2 =0.0759, β=0.381) with a significant p-value (*p*=0.000), at 0.01% 2-tailed level (MSE=0.3245, F (2, 1026) =42.1198, *p*=0.000). Technology Use mediated partially on TRI to Technology Barriers (R^2 =0.056, β= -0.3814, *p*=0.000) with negative regression estimate. The sequential mediation of Technology Barriers and Technology Use on Technology Readiness to Technology Adoption (R^2=0.301, β=0.3805, *p*=0.000) confirmed. So, the fourth research hypothesis was accepted.

15. IMPLICATIONS OF THE STUDY

The correlation analysis showed that there was positive correlation between Technology Adoption and Technology Readiness among of HSS Teachers. However, it was found that there was weak correlation between Technology Adoption and Technology Readiness which indicated the possibility to improve the Technology Adoption through TRI and sub-dimensions. Therefore, Optimism and Innovativeness need to be strengthened by the policymakers, school authorities and finally, each teacher may take efforts to improve Technology Readiness. The individual attention in the technology training can improve the Technology Readiness aspect of the teachers, especially their technology-related Optimism and Innovativeness. Further, the technology trainings needed to be reorganized to reduce teachers' technology-related Insecurity and Discomfort.

The weak correlation between the Technology Adoption and Technology Exposure of the HSS teachers was positive in nature. Management may provide cognitive and practical exposure of the technology training to accelerate their Technology Adoption processes. The technology training for the teachers have to maintain a proper mix of practical well as the logical aspect of the technology use.

The weak positive correlation between the Technology Adoption and Technology Anxiety implied that Technology Anxiety has a little positive role in increasing the Technology Adoption. The weak correlation between Technology Anxiety and Technology Barriers was positive and with Technology Use it was negative. It implied that the technology trainings and the technology systems can influence a little to increase their Technology Adoption process. The support of the peer groups and the detailed directions through the timely helplines of the technology systems could reduce the excessive Technology Anxiety.

The moderate correlation between Technology Adoption and Technology Barriers was negative in nature which indicated that the perceived Technology Barriers of the teachers needed to be disbursed in right time to achieve the planned Technology Adoption rate in education systems. The weak correlation between Technology Barriers and Technology Use was negative in nature. The social media use and other application use can reduce the with high Technology Barriers. The raise in the technology training exposure considerably reduces the Technology Barriers.

The weak positive correlation between Technology Adoption and Technology Use indicated that the moderate use of media can foster the technology-based education process. The education policy makers and education managements may impart more training on the direct teaching apps and technology systems than depending the lateral models of social media-based learnings. It also supports the researches to integrate the social media like features of mutual academic discussion with in the teaching apps and technology systems.

The negligible correlation between Technology Exposure and Technology Readiness were positive. Teachers with high Technology Readiness can even experiment with the novel technology features without the spell of discomfort or insecurity. The negligible negative correlation between the Technology Anxiety and Technology Readiness implied that the teachers with rather high TRI may

experience rather less apprehensive feeling when faced with the possibility of using a new technology or technology atmosphere at schools.

TRI and perceived Technology Barriers of the HSS teachers correlated in weak manner. The increased Technology Barriers were contributed by the discomfort and insecurity aspects of the TRI. The negative aspect of this correlation implies that the teachers discomfort and insecurity dimensions needed to be addressed effectively by the administrators to reduce their Technology Barriers, which in turn increases their technology use. The weak correlation between the Technology Use and Technology Readiness of the HSS teachers was positive in nature and it indicated that use of technology platforms related with the TRI of the teachers. The increased Technology Use increased their technology-based teaching process as the technology use was essentially oriented towards the Technology Adoption process. The moderate correlation between Technology Exposure of the teachers with Technology Barriers was negative in aspect. It indicated the need of more technology exposure to reduce Technology Barriers.

The regression analysis affirmed that the Technology Adoption of the HSS teachers predicted by sub-dimensions of TRI with a weak effect. This implies that the considerable role of TRI of the HSS teachers in their educational Technology Adoption and their insecurity is to be addressed by the managers in an apt manner. The regression analysis also confirmed that the sub-dimensions of the Technology Use predicted by Technology Adoption with a very weak effect. On regression analysis it is also affirmed that the Technology Adoption predicted TRI, Technology Anxiety and Technology Barriers of the HSS teachers with a moderate effect. These regression results support that the HSS management has to improve these positively predicting factors detailed in the correlation discussions.

The mediation analysis affirmed the partial mediation role of the Technology Anxiety on the TRI to Technology Adoption process and it also mediated the TRI to Technology Barriers. The negative partial mediation was through Technology Barriers on TRI to Technology Adoption. These negative

mediations affirmed that the existence of the Technology anxiety and Technology Barriers reduced the predictive capacity of the TRI. The sequential negative mediation of the Technology Anxiety and Technology Barriers implied that these needed to be controlled. These two aspects of the adoption can maintain an organic thrive in Technology Adoption processes.

Teachers' Technology Exposure has moderating impact on their TRI to Technology Adoption process and their Technology Use positively mediated TRI to Technology Adoption. These mediation analyses imply that HSS teachers' Technology Adoption were rather influenced through their Technology Exposure and Technology Use. The effective time on the educational technology platforms needed to be made available with user friendly features to increase the Technology Exposure and thereby its usage.

The analysis of mediation between Technology Exposure to Technology Adoption through the Technology Anxiety and Technology Barriers affirmed that the Technology Barriers were reduced with Technology Exposure as in the mediation analysis of TRI-Technology Adoption. Neglecting these factors and implementing the technology platforms under the coercion of the authority through the glasses of appraisal, it might produce only a temporary effect.

16 RECOMMENDATIONS FOR FURTHER RESEARCH

This study based on three theoretical aspects of technology adoption can be further extended with respect to the new evolving technology-based education models fostered by Covid-19 situations. Emergency situational factors may be studied with the adoption process. Findings of this study will be useful in reformulating and modifying the teacher technology training programs, technology implementation process and will be helpful in digital pedagogy formulation in strategic policy levels.

17. LIMITATIONS OF THE STUDY

- Even though care has taken to limit the errors to minimum at all stages of research, personal attitudes of the responded could influence the research to a limited extent.
- Confidential data related Technology Adoption were not included in the report due to the ethical concerns and as directed from the respondents.
- The incomplete data were eliminated.
- The lengthy questionnaire could have influenced the quality of responses.

18. CONCLUSION

The weak relation between Technology Adoption and Technology Readiness, Technology Exposure, Technology Anxiety, Technology Barriers, Technology Use by Higher Secondary School teachers were affirmed. The Technology Adoption process was negatively predicted by Technology Anxiety and Technology Barrier and which were reduced with the Technology Readiness and Technology Exposure of the Teachers. Technology Anxiety and Technology Barriers has mediating role on Technology Readiness to Technology Adoption. Technology Exposure and Technology Use has mediating role on Technology Readiness to Technology Adoption. The Technology Use positively mediated Technology Adoption process. The implications of this research are very relevant and needed to be implemented in the education systems.

19. TENTATIVE STRUCTURE OF THE DISSERTATION

The brief description of the chapters of the dissertation is given below.

Chapter-1 Introduction: This chapter gives the detailed over view of the research on the education technology incorporation, education system, theoretical frame work of the Technology Adoption and the associated factors, proposed research design, statement of the problem, need for the study, research questions, and research objectives.

Chapter-2 Review of Literature: This chapter deals with the detailed review of the related researches conducted with reference to the variables identified for this research. This section is arranged on the variables of the study in a reverse chronological order.

Chapter-3 Research Methodology: This chapter explains the methodology used in conducting this study. It includes the population under study, sampling design, sample size, instruments of the data collection, techniques for data analysis.

Chapter-4 Data analysis and Interpretation: This chapter provides discussion on data analysis based on the objectives. The general hypothesises were spilt in to testable ones and were tested with statistical tools and interpreted the results.

Chapter-5 Summary, Findings and Discussion: This chapter deals with findings after the data analysis, discussion and implication of the findings, and managerial applications. It also gives the scope of further research and over all conclusion of the research.

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APPENDICES

APPENDIX A: Research Questionnaire

This is an academic research about the Technology use in Teaching-learning process at Higher secondary Schools by the Teachers. This research is conducted with due permission from the authorities and from the university. I thank you in anticipation for participating in this academic survey. Answer all the questions and sessions of this questionnaire. In case of any doubt or need any clarification, please do not hesitate to clear it from me before the recording your valuable responses.

All information provided will remain strictly confidential and will be analysed in aggregate form only. All relevant codes of research ethics will be kept in this research.

Fr Genimon V Joseph, 9447373415, Research Scholar, Christ (Deemed to be University), Bangalore

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Gender: ☐ Male ☐ Female

School type: ☐ Govt. ☐ Aided ☐ Unaided ☐ CBSE/ICSE

Age: .....yrs (on 1 Jan,2019) Educational district: .....

UG/PG specialization: ..... Highest Qualification: ....

Teaching experience: .....yrs & .....months (on 1 Jan,2019)

I have undergone computer training in ..... duration .....

1. I am using internet at home with.. ? ☐ Mobile ☐ Lap top /PC ☐ Not using at home

2. On an average, I am spending .....**Minutes (daily)** with computer/mobile for class preparation

3. For each question please **mark round** [⊗] to one of the **best answers** (five scale) as follows:

1= Strongly disagree; 2= Somewhat disagree; 3= Neutral; 4= Somewhat agree; 5 = Strongly agree

Technology Readiness 2.0: It measure ones' tendency to embrace and use cutting-edge technologies		
A1	New technologies contribute to a better quality of life	
A2	Technology gives me more freedom of mobility	
A3	Technology gives people more control over their daily lives	
A4	Technology makes me more productive in my personal life	
B1	Other people come to me for advice on new technologies	

B2	In general, I am among the first in my circle of friends to acquire new technology when it appears	
B3	I can usually figure out new high-tech products and services without help from others	
B4	I keep up with the latest technological developments in my areas of interest	
C1	When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone, who knows more than I do	
C2	Technical support lines are not helpful because they don't explain things in terms I understand	
C3	Sometimes, I think that technology systems are not designed for use by ordinary people	
C4	There is no such thing as a manual for a high-tech product or service that's written in plain language	
D1	People are too dependent on technology to do things for them	
D2	Too much technology distracts people to a point that is harmful	
D3	Technology lowers the quality of relationships by reducing personal interaction	
D4	I do not feel confident doing business with a place, that can only be reached online	

"These questions comprise the Technology Readiness Index 2.0 which is copyrighted by A. Parasuraman and Rockbridge Associates, Inc., 2014. This scale may be duplicated only with written permission from the authors."

4. The below given section measure the Technology Adoption. For each question please mark round [⊗] to one of the best answers (five scale) as follows:

1= Strongly disagree; 2= Somewhat disagree; 3= Neutral; 4= Somewhat agree; 5 = Strongly agree

Technology Adoption in the Teaching/Learning Process- by Kotrlik		
T1	I emphasize the use of technology as a learning tool in my classroom or laboratory.	
T2	I assign students to use the computer to do content related activities on a regular basis.	
T3	I incorporate technology in my teaching to such an extent that it has become a standard learning tool for my students.	
T4	I design learning activities that result in my students being comfortable using technology in their learning.	
T5	I have made physical changes to accommodate technology in my classroom or laboratory.	
T6	I expect my students to fully understand the unique role that, technology plays in their education.	

T7	I expect my students to use technology, to enable them to be self-directed learners.	
T8	I expect students to use technology to such an extent that they develop projects, that are of a higher quality level than would be possible without using technology.	
T9	I expect my students to use technology so, they can take on new challenges beyond traditional assignments and activities.	
T10	I discuss with students how they can use technology as a learning tool.	
T11	I use technology to encourage students, to share the responsibility for their own learning.	
T12	I regularly pursue innovative ways to incorporate technology into the learning process for my students.	
T13	I am more of a facilitator of learning, than the source of all information, because my students use technology.	
T14	I use technology-based games or simulations on a regular basis, in my classroom or laboratory.	
T15	I incorporate technology in my teaching to such an extent that, my students use technology to collaborate with other students in my class during the learning process.	

5. The next session is about the use of the Technology for personal and teaching purposes. In a week, how many times you are using the following technologies? **Give Nos or give the scale.**

0= Never used; a= less than 3 times; **b=** 4- 7 times; **c=** 8- 14 times; **d=** 15-21; **e=** above 22 times

WhatsApp		SMS		Internet Banking/ Mobile apps	
Face book		Mobile call		Teaching apps	
Search(Google)		Video call		Power point	
Mail		Blog/ others		Word/Excel	
Instagram		Conference call		ICT / IT@ school	
YouTube ……. Linked-In ..... Share-chat ..... Tik-tok ..... Flickr ..... Snapchat…… Others (specify):					

6. Name few technologies/apps/sites that will help the teaching, easier: .....

7. provide response to every statement given in the table below as per the direction given

For each question below, please mark round [⊗] to one of the best answers (five scale) as follows:

1= Strongly disagree; 2= Somewhat disagree; 3= Neutral; 4= Somewhat agree; 5 = Strongly agree

	Technology Barriers Scale	**Responses↓** ⊗

E1	I have enough time to develop lessons that use technology.	
E2	I get enough technical support to effectively use instructional technology in the teaching/learning process.	
E3	Enough effective instructional software is available for the courses I teach.	
E4	We have scheduled enough time for students to use the Internet, computers, or other technology in the teaching/learning process.	
E5	Technology is available in school for every student in my classes.	
E6	Administrative support is available for integration of technology in the teaching/learning process.	
E7	I am able to integrate technology in the teaching/learning process	
G1	Cluster training were very useful and effective for my class room teaching	
G2	IT training helped me to use the software-Ubuntu- in a better way	

Record your most appropriate response after reading the statements given below as per the criteria given below. This questionnaire is about the anxiety in using Technology.

1= Not at all anxious; 2= A little anxious; 3 = Moderately; 4= Somewhat anxious; 5 = Extremely anxious		
F1	How anxious do you feel when you cannot keep up with important technological advances?	
F2	How anxious do you feel when you hesitate to use technology, for fear of making mistakes you cannot correct?	
F3	How anxious do you feel, when you avoid using unfamiliar technology?	
F4	How anxious do you feel, when you are not certain, what the options on various technology will do?	
F5	How anxious do you feel when you are faced with, using new technology?	
F6	How anxious do you feel when someone uses a technology term, that you do not understand?	
F7	How anxious do you feel when you, try to understand new technology?	
F8	How anxious do you feel when you try to learn technology related skills?	
F9	How anxious do you feel when you fear, you may break or damage the technology you are using?	
F10	How anxious do you feel when you try to use technology?	
F11	How anxious do you feel when you think about your technology skills, compared to the skills of other teachers?	
F12	How anxious do you feel when you think about, using technology in instruction?	

These scales developed to measure the stage in which a technology is selected for use by a teacher (Redman and Kotrlik, 2009)

APPENDIX B: Publications and Conference Presentations

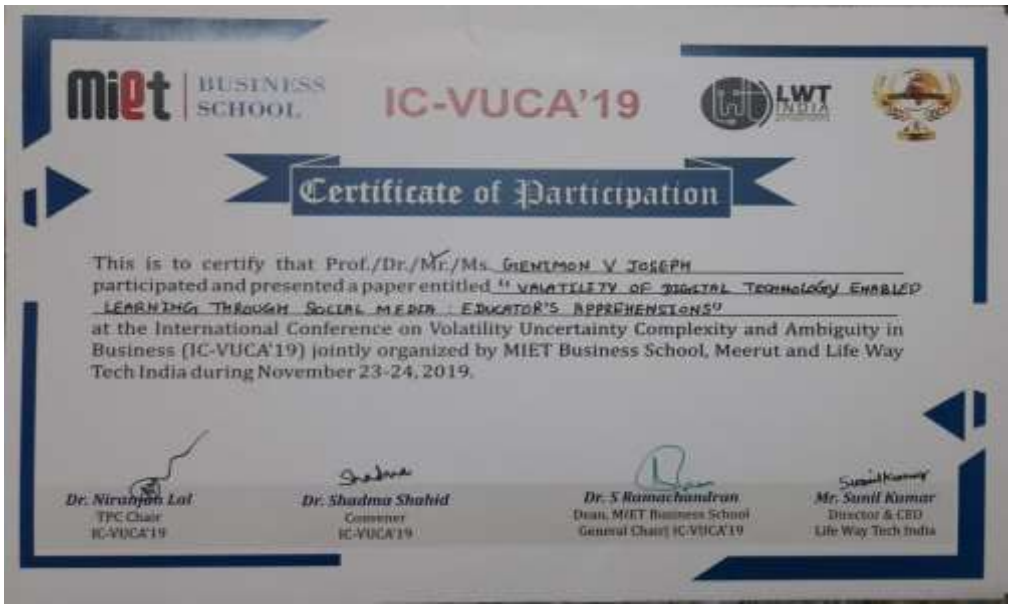
Publications

1 Joseph, GV & Thomas, KA (2020). Volatility of Digital Technology-enabled Learning through Social Media: Educators' Apprehensions. *Test Engineering and Management*, 82(1), 5832–5839.

2 Joseph, GV & Thomas, KA (2020). Moderating effect of Social Media Usage on Technology Barriers to Technology Adoption by Teachers. *International Journal of Advanced Science and Technology.* 29 (1), 5504-5512

Paper Presentation

1. Joseph, GV & Thomas, KA (2019, August 22-24). *Impact of Technology Readiness on Teacher Engagement in Higher Secondary Schools* [Conference presentation]. National Seminar on Education: Systems, Practices and Research, at CEDBEC, CU, Bangalore
2. Joseph, GV & Thomas, KA (2019, November 22-24). *Volatility of Digital Technology-enabled Learning through Social Media: Educators' Apprehensions* [Conference presentation]. International Conference on Volatility, Uncertainty, Complexity and Ambiguity in Business, Meerut.


miet BUSINESS SCHOOL
IC-VUCA'19
LWT INDIA
Certificate of Participation
This is to certify that Prof./Dr./Mr./Ms. GENIMON V JOSEPH
participated and presented a paper entitled "VOLATILITY OF DIGITAL TECHNOLOGY ENABLED LEARNING THROUGH SOCIAL MEDIA : EDUCATOR'S APPREHENSIONS"
at the International Conference on Volatility Uncertainty Complexity and Ambiguity in Business (IC-VUCA'19) jointly organized by MIET Business School, Meerut and Life Way Tech India during November 23-24, 2019.
Dr. Niranjan Lal
TPC Chair
IC-VUCA'19
Dr. Shadma Shahid
Convener
IC-VUCA'19
Dr. S Ramachandran
Dean, MIET Business School
General Chair| IC-VUCA'19
Mr. Sunil Kumar
Director & CEO
Life Way Tech India

Certificate
CHRIST
This is to certify that
Fr Genimon V Joseph
CHRIST (Deemed to be University), Bangalore
Presented a Paper in the
NATIONAL SEMINAR
ON
EDUCATION: SYSTEMS, PRACTICES AND RESEARCH
Organized by the School of Education in association with
Centre for Education Beyond Curriculum (CEDBEC)
CHRIST (Deemed to be University), Bangalore on 22 - 24 August 2019
The paper presented was:
The Impact of Technology Readiness on Teacher Engagement in Higher Secondary Schools
Date: 24 August 2019
CU: CEDBEC: NSHESPR: PP/8/2019
Dr Anil Joseph Pinto
Registrar

APPENDIX C: Permission from Kerala Government

Government of Kerala

KERALA INFRASTRUCTURE AND TECHNOLOGY FOR EDUCATION

No. KITE/2019/1211 (5) Date : 05.03.2019

Mr.Genimon.V.Joseph
Research Scholar, Reg No.1620072
Christ University,
Bangalore

Sir,

Sub:- KITE - Conducting survey among selected teachers in Kannur, Wayanad and Kasargod districts as part of Research – Reg.

Ref: Your email dated 01.02.2019 and subsequent discussions with VC & ED, KITE

I may inform you that your request for conducting survey among selected teachers in Kannur, Wayanad and Kasargod districts as part of your research thesis titled 'Influence of Technology readiness and technology barriers on technology adoption by Teachers' has been approved by Secretary, General Education Department. You may proceed with your survey in the month of March 2019 and submit a copy of your research paper on completion.

Yours faithfully,

K. ANVAR SADATH
VICE CHAIRMAN & EXECUTIVE DIRECTOR

VICTERS
Poojappura P.O, Thiruvananthapuram 695 012 Kerala India
Tel : +91 471 2529800 Fax : 0471 2529810 contact@kite.kerala.gov.in
www.kite.kerala.gov.in
(CIN : U74999KL2017NPL049848)